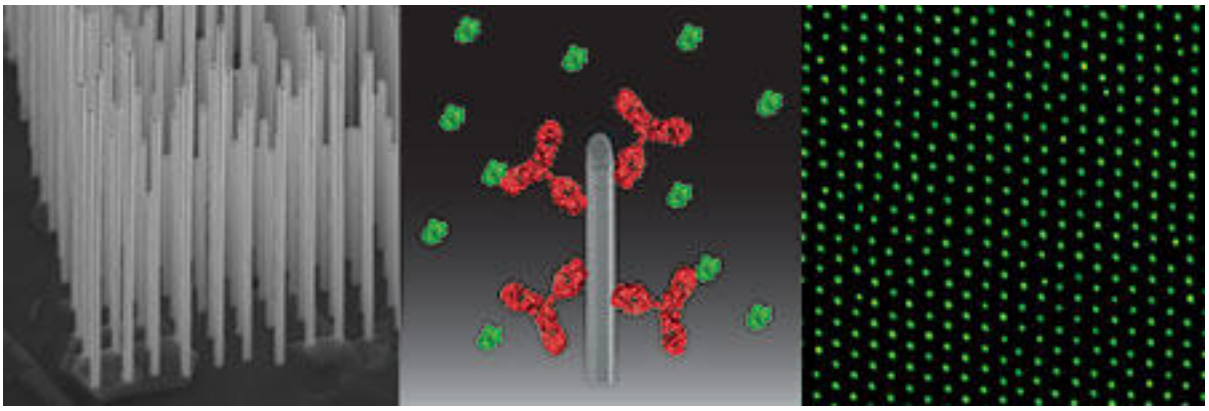
Great Potential for Faster Diagnoses with New Method

University of Copenhagen



The more accurately we can diagnose a disease, the greater the chance that the patient will survive. That is why many researchers are working to improve the quality of the diagnostic process. Researchers at the Nano-Science Center, University of Copenhagen have discovered a method that will make the process faster, cheaper and more accurate. This is possible, because they are combining advanced tools used in physics for research in biology at nanoscale, two scientific disciplines usually very distant from each other.

Many diseases can be diagnosed using so-called biomarkers. There are substances, for example, that can be measured in a blood sample, which shows that the patient is suffering from the disease in question. These biomarkers are often proteins that are found in very small quantities in the blood, making it difficult to detect them. By measuring them, the diagnosing is more precise and many diseases can be detected very early, before the patient develops severe symptoms.

- We have developed a method in which we optimise the analysis of the proteins. A central point of this method is the use of nanowires to hold the proteins while we analyse them. It is unique, explains Katrine R. Rostgaard [1], a PhD student at the Nano-Science Center, Department of Chemistry, University of Copenhagen [2].

Researchers normally use small plates to hold the proteins when they need to be analysed, but by using nanowires, which are cylindrical structures having a diameter of about 1/1000th of a human hair, they add a third dimension to the sample. The nanowires stand up like a little forest, creating a much greater surface area to hold the proteins because they can sit on all sides of the nanowire.

- With greater area, we can hold more proteins at once. This makes it possible to measure for multiple biomarkers simultaneously and it increases the signal, thereby providing a better quality of diagnosis, says Katrine R. Rostgaard about the method, which has just been published in the journal Nanoscale.

Profitable method for diagnosing

The research is done at the nanoscale on small size samples. The forests of nanowires are used to capture the proteins they want to study directly. When examining the proteins, you can reuse the nanowires by performing a multiple tests on the same protein. This simplifies the workflow in the laboratory tremendously in comparison to the conventional method, where researchers have to start over with a new plate to hold the proteins every time they perform a new analysis. In this way, the method helps to make the diagnostic process more environmentally friendly and economically viable for use in, for example, industry.

- We know that several major biotech companies will be interested in our new method and find potential applications, though it requires improvements before it is ready for use in the industry, explains Karen Martinez [3], research group leader of the Nanobio group at the Nano-Science Center, Department of Chemistry, University of Copenhagen. [4]

The work is part of two larger projects, ANaCell and UNIK Center for Synthetic Biology [5], which is financed by The Danish Council for Strategic Research [6] and the Ministry of Science, Technology and Innovation [7].

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